

Abstract Submitted
for the 4CF07 Meeting of
The American Physical Society

Error-correction in distributed computational networks using self-organized collective dynamics BRIAN MYERS, DAVID PEAK, Utah State University — Dynamical processes on networks often exhibit self-organized collective behavior in which the activities of large numbers of nodes spontaneously synchronize without the intervention of a central processing unit (CPU). Sometimes such a synchronized state can be interpreted as “performing a useful task.” For concreteness, suppose the nodes of the network can take on state values 0 or 1. Initially, the network has some heterogeneous distribution of states, in which the majority state is assumed to be “correct” and the minority state is an “error.” The task is to identify which state is in the majority and to change all of the minority states to the correct value—without the assistance of a CPU. We show how the nodes can be wired together in a locally-connected architecture to produce a spatio-temporal dynamical system whose attracting state is all 0s or all 1s, depending on which was initially in the majority. We discuss a specific application for such a network that could potentially be of use aboard spacecraft in hostile radiation environments.

David Peak
Utah State University

Date submitted: 12 Sep 2007

Electronic form version 1.4